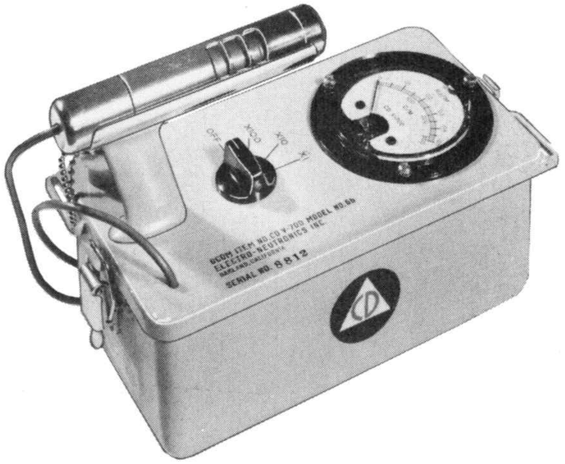
section 4

CD V-700-6B



specifications:

- **Ranges:** 0-0.5, 0-5, 0-50 mr/hr
- **Sensing Element:** Geiger Tube
- **Accuracy:** ±15% of true dose rate from cobalt 60 or cesium 137 gamma radiation
- **Batteries:** Four 1-1/2 volt NEDA 13
- **Dimensions:** approx. 9" long x 4-1/2" wide x 7" high including handle
- **Weight:** approx. 5 lbs. including batteries

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GENERAL DESCRIPTION

The Electro-Neutronics CD V-700 model 6B is a portable geiger counter instrument designed for the detection of low levels of beta and gamma radiation. The geiger tube is mounted in a probe on the end of a thirty-six inch cable. The entire instrument and its accessories include a circuit box, a probe, a headphone, and a carrying strap. A radioactive sample is mounted on the side of the case for checking the operation of the instrument.

Sensing Indicators and Control

A meter with a scale reading in milliroentgens per hour (mR/hr) is used for visual indication and a headphone is used for aural monitoring. The meter is ruggedized and sealed in a plastic case to meet the instrument requirements for water-tightness, shock and vibration resistance.

The meter is controlled by the range selector switch labeled "OFF, X100, X10, and X1". The range switch changes only the meter ranges. It does not affect the number of "clicks" in the headphone.

Readings

Table 4-1 lists switch positions and the corresponding meter readings. Figure 4-1 shows the meter face. Readings should not be taken with the pointer indicating in the lower 10% of the scale. Turn to the next most sensitive range until the pointer indicates in the upper 90% of the scale.

Switch Position	Counts/Minute	mR/hr
X1	0-300	0-0.5
X10	0-3000	0-5.0
X100	0-30,000	0-50

Table 4-1. Switch Positions vs Meter Readings

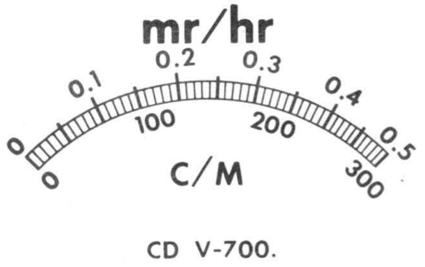

Figure 4-1. Meter Face

Initial Check

With the batteries installed, turn the range switch to the X10 position. Close the beta window of the probe. After thirty seconds the circuit should be stabilized and the meter should read zero in the absence of radiation.

Open the beta window on the probe and place the open window on the center of the OPERATIONAL CHECK SOURCE on the side of the instrument. The meter reading should average between 1.5 and 2.5 mR/hr.

Background Count

Normal background radioactivity is about 0.01 to 0.02 mR/hr or about 20 counts per minute. Counts are randomly spaced and several seconds may elapse before any activity registers on either the meter or the headphone. Accurate measurements of background and other low level radiation can be made by counting the headphone "clicks" against a watch that has a second hand. Note the number of counts occurring in a time period of 5 minutes. Divide the number of counts by 5 and the background count is expressed in terms of counts per minute. More accurate measurements may be made by extending the time period.

Batteries

The CD V-700-6B is powered by four 1-1/2 volt "D" size flashlight batteries. The batteries will operate the instrument continuously for over 100 hours and intermittently for over 175 hours. Refer to Appendix A for acceptable types and makes of batteries.

Installation

Open the instrument by lifting the pull catch at each end of the case and separating the two halves to expose the battery holders and the retaining clips. Remove the clips by squeezing the ends and lifting. Insert fresh batteries according to the polarity marked on the inside of the battery boxes. (See figure 4-2) The battery box will not accept the batteries with the polarity reversed. In an emergency, two batteries can be used instead of four. Battery life is cut in half under these conditions. When using two batteries, install one on each end of the battery compartment. Install the battery clips and close the case by aligning the two halves and closing the pull catch closures.

Replacement

If the instrument fails to operate, check the batteries before attempting to make any repairs or adjustments. A battery tester may be used or the batteries may be checked under load with a voltmeter while installed in the instrument. It is recommended that all the batteries be replaced at one time to avoid exceeding the shelf life of any one cell.

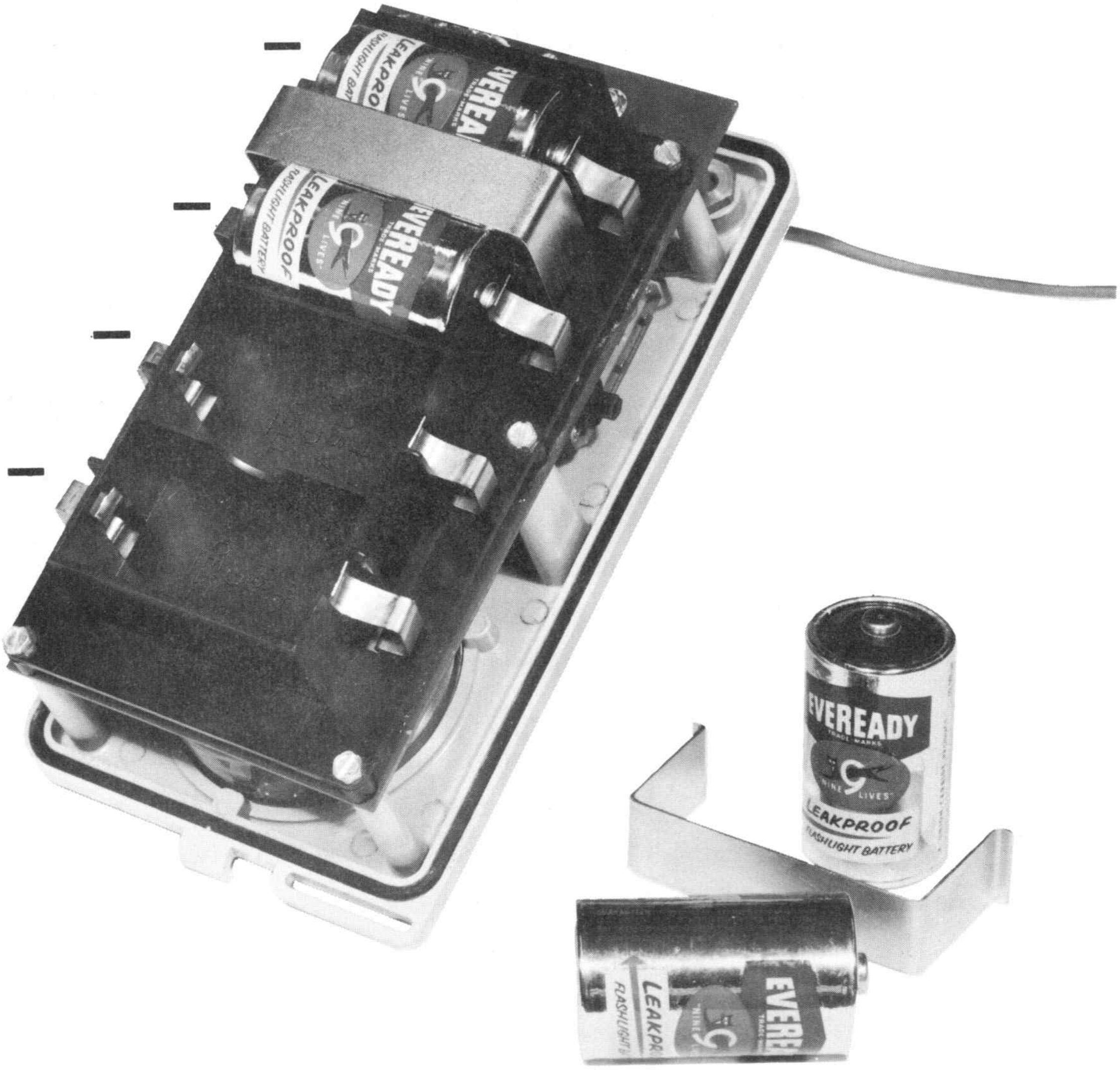

Figure 4-2. Battery Installation

Electronic Circuitry

High Voltage Supply

The high voltage supply consists of a blocking oscillator circuit in which pulses are generated by a transistor, V4, alternately cut-off and saturated. The transformer windings between the base and collector are so phased that when the collector current starts to flow, the voltage at the base goes in the negative direction. As the base becomes negative, the collector current increases still further causing the base to become more negative. The collector current increases until the transistor saturates, at which point the collector cannot supply the current demanded by the signal at the base. At this point, since there is no rate of change of current in the transformer, there is no signal induced in the base winding. Therefore, the emitter current decreases, decreasing the collector current. The signal then induced at the base of the transistor is such as to make this action cumulative until the transistor cuts off. The collector current stops abruptly, causing a large rate of change of current in the transformer. This makes the base go negative, which in turn starts the collector current flowing and the cycle repeats.

The step-up ratio between the collector winding and the secondary winding produces a high voltage pulse, which is then rectified by the selenium rectifier, CR5.

The DC output voltage developed across capacitor C8 is regulated in the primary section of the transformer where the zener diode CR6 limits the amplitude of the input pulse. This regulates the high voltage at approximately the proper level for operation of the geiger tube.

Pulse Shaping and Metering Circuit

The pulse shaping and metering circuit is basically two transistors, a rectifier and a meter. Transistors V2 and V3 form a monostable multivibrator. A negative pulse from the geiger tube is coupled to the base of V2, the normal cut-off transistor. This pulse causes V2 to conduct, and a positive pulse is developed on its collector. The positive pulse is coupled to the base of V3 through the timing capacitor and cuts off transistor V3. The resulting negative pulse on the collector of V3 is coupled to the base of V2 via choke L1. This condition with V2 conducting and V3 cut off will continue for a period determined by resistor R8 and the timing capacitor selected by the range switch. The voltage pulse at the collector of V2 is rectified by silicon rectifier CR3 and fed to the meter, M, through current limiting resistors R3 or R6. The voltage pulses at the meter are integrated by capacitor C1. The average voltage indicated on the meter is proportional to the frequency of the input pulses. Resistor R4 calibrates the instrument by shunting some of the current around the meter.

Audio Circuit

Aural monitoring is achieved by a transistorized pulse amplifier and a headphone. Each pulse counted by the pulse shaping circuit develops a negative pulse at the collector of V2. The pulse is shaped and isolated from the headphone by diodes CR1 and CR2, capacitor C2 and resistor R1. When the headphone is connected at the jack a pulse of approximately 11 volts is developed across the headphone, resulting in a clear, audible click.

SERVICING

Precautions

High Voltage Power Supply

The high voltage power supply of the instrument operates in excess of 900 volts. The shock is uncomfortable rather than dangerous but should be avoided. The high voltage components should not be touched even when the instrument is turned off until the high voltage capacitor has been discharged. This capacitor is to be discharged by shorting point H to ground. (See figure 4-3) Do not short the geiger tube leads since this may cause component damage in some models.

Geiger Tube

Care must be exercised not to dent the geiger tube. Dents in the tube may cause arcing at voltages lower than the operating voltages and the tube will be useless. Dropping the tube may break the seal, allowing the gas mixture to leak.

Semi-conductor Components
(Diodes and Transistors)

The diodes and transistors used in the instrument may be damaged by prolonged heating during soldering. When replacing any of these components, the soldering operation should be done quickly. Hold the lead between the component and the joint with a heat sink to decrease the amount of heat transmitted to the component. Techniques are described in Appendix F.

Headphone

The white plastic cover on the headphone may break off if the headphone is dropped or roughly handled. Exercise caution when using the headphone.

Electronic Circuitry

When checking voltages, be careful not to short any of the leads on the printed circuit board. Often the transistors and diodes are damaged when subjected to these overloads.

Disassembly Instructions

1. Open the pull catch at each end of the case and remove the instrument from the case bottom.
2. Remove the batteries from the battery box.
3. Remove the six hex-head screws from the battery box. Remove the battery box noting that the + side of the battery box mates with the + marked on the circuit board.
4. Remove the two nuts and washers at the meter terminals and the hex-head screw and lockwasher on the circuit board.
5. Remove the range switch knob by loosening the two set screws. Press on the switch shaft and the circuit board should come loose from the case top. The board will still be connected to the case top by the geiger tube lead and the headphone jack connection. These may be removed if repairs are necessary on these components.
6. Reassembly is the reverse of the above process. The ground lug connected to the shielded cable must be connected between the circuit board and the case top leg near the other geiger tube lead. The battery box contacts must be inserted into the holes in the circuit board to make a good connection. A soldering aid is helpful in aligning the contacts and holes.

Preventive Maintenance

It is recommended that preventive maintenance be carried out once a month when the instrument is in use and once every six months when the instrument is in storage.

1. Remove the batteries, clean the battery contacts and battery terminals if necessary, and remove any corrosion present. Remove the battery box and tin the points on the circuit board where the battery clips make contact. File the ends of the battery clips.
2. Replace all batteries which do not exceed minimum voltages.
3. Perform the Initial Check as described on page 4-2.
4. If the instrument is to be shipped or stored, remove the batteries and set the range switch to one of the sensing ranges. This will shunt the meter and minimize damage from the movement of the pointer during shipment or storage.

Do not use solvents on plastic parts. Clean with soap and water. If the batteries have leaked, remove the case bottom and wash it with warm soapy water being careful not to soak off the circuit diagram or the CD decal. The battery spillage will be loosened in a short while and can be rinsed out.

Repairs

Replacing the Geiger Tube

1. Grasp the end caps of the probe and twist in a counterclockwise direction to unscrew the tube housing from the socket housing.
2. Insert the new geiger tube into the socket pressing the tube into the socket and against the rubber gasket.
3. Place the tube housing over the geiger tube.
4. Engage the threads of the tube housing and cord cap with a steady pressure against the shock mounting spring and screw together in a clockwise direction.

Replacing the Parts Module

The ENI-A Parts Module is mounted on a ceramic base and should be handled in the same manner as the ceramic-based calibration potentiometers described in Appendix F. Remove the module by squeezing together the two clips on the ends of the module, heating the solder connections and pulling upward. Use an appropriate desoldering tip.

Capacitor C2, which is mounted on the side of the module, may be replaced separately. Heat the solder connections on both sides of the ceramic, using care not to overheat the resistive elements painted on the ceramic.

Replacing the Geiger Probe

1. Remove the battery compartment and unsolder the probe lead from the circuit board.
2. Remove the seal nut with an adjustable wrench.
3. Untie the knot, remove the solder lug, and pull the cable through the hole in the case top.
4. Prepare the new cable according to instructions in Appendix F.
5. Twist the center conductor and shield together to allow the wire to be inserted through the case top. Pull on the end of the cable with pliers until a sufficient amount extends through the case top.
6. Replace the seal nut and washers on the new cable and tighten the seal nut using moderate pressure. Excessive tightening can damage the cable. Tie a knot in the cable near the seal nut.
7. Connect the cable to the circuit board and replace the battery compartment. The ground lead is soldered to a lug under the nearest case top leg.

Replacing the Meter

The meter terminals are connected directly to the printed circuit board. Use washers, spacers, and nuts to connect the new meter. Position the spacers so that no strain is exerted on the circuit board.

Replacing the Switch

1. Follow the Disassembly Instructions through step 5.
2. Heat each switch terminal on the circuit board, one at a time, and press sideways on the switch shaft. This will tend to lift the terminals from the circuit board. Repeat this procedure several times, pushing

away from the solder joint each time, until the switch is free.

3. Open the holes on the circuit board with a soldering pencil and soldering aid to allow the switch terminals to be inserted.
4. Insert the new switch and solder each terminal using a minimum amount of heat. Be sure the switch is seated properly so that the shaft will fit through the hole in the case top.

Trouble Shooting

The information in this section is presented as an aid to the service technician in determining the causes of specific instrument faults. The Trouble Shooting Guide lists the most probable causes of instrument failure together with suggestions for corrective action. This should be consulted and followed after the following preliminary steps have been taken:

1. Disassemble the instrument through step 3 of the Disassembly Instructions.
2. Check all batteries. Make sure they provide sufficient voltage for proper operation of the instrument.
3. Check the printed circuit board for broken foil, cold solder joints, or solder bridges.
4. Check for broken components.

Table 4-2, Test Point Chart, and figure 4-3, Location of Test Points, eliminate the need for circuit tracing when making voltage and resistance measurements. The Test Points are referred to in the NOTES column of the Trouble Shooting Guide, and are also found on the schematic circuit diagram.

TROUBLE SHOOTING GUIDE

◆◆◆

SYMPTOM		PROBABLE CAUSE	CORRECTIVE ACTION	NOTES
Meter	Headphone			
Dead	Dead	Geiger tube defective or not compatible with instrument's high voltage	Replace geiger tube or correct instrument's high voltage	Check starting voltage of tube. This must be lower than voltage at point H
		Battery clips making poor contact to circuit board	File bottom of clips, tin appropriate areas on circuit board	
		Probe shield shorting to high voltage power supply	Dress leads	Voltage at H=0. V2, CR7 may be damaged
		Geiger probe defective	Repair or replace geiger probe	V2, CR7 may be damaged
		CR4 open	Replace CR4	Voltage at A, M=0. Voltage at H normal
		CR5 defective	Replace CR5	Voltage at H low
		CR6 defective	Replace CR6	Voltage at H low
		CR7 open	Replace CR7	Voltages normal

SYMPTOM		PROBABLE CAUSE	CORRECTIVE ACTION	NOTES
Meter	Headphone			
Dead (cont'd)	Dead (cont'd)	V4 defective	Replace V4	Voltage at A, M, H low. Check V4 for beta and shorts. Check T1 before replacing V4
		V2 defective	Replace V2	Check V2 for beta and shorts. Check probe and C5 for shorts before replacing V2
		V3 defective	Replace V3	Check V3 for shorts
		T1 defective	Repair or replace T1	Check resistances at F - G J - L K - ▲
		C5 open	Replace C5	Voltages normal. Check by tapping with screwdriver at probe pin 1 and at point D
		C5 shorted	Replace C5	Voltage at H low. V2, CR7 may be damaged
		C6 shorted	Replace C6	Voltage at A, M, H low
		C8 open	Replace C8	Voltage at H low
		C8 shorted	Replace C8	Voltage at H=0

		Open contact on S1A	Repair switch	Check continuity at E - F
Dead	Weak	V3 defective	Replace V3	Check V3 for shorts
Dead (X100 only)	Weak	C3 open	Replace C3	
		Open contact on S1B	Repair switch	Check continuity at M- R
Dead (X10, X1 only)	Weak	C4 open	Replace C4	
		Open contact on S1B	Repair switch	Check continuity at M- S
Dead	Normal	Meter defective	Repair or replace meter	
		Calibration control turned fully counterclockwise	Recalibrate	
		CR3 open	Replace CR3	Test by shorting
		Poor contact between meter terminals and circuit board	Tin appropriate area on circuit board	
		L1 open	Replace L1	
		C1 shorted	Replace C1	
		Open contact on S1C	Repair switch	Check continuity at P - N P - Q

SYMPTOM		PROBABLE CAUSE	CORRECTIVE ACTION	NOTES
Meter	Headphone			
Normal	Dead	Poor connection in headphone plug or jack	Repair connection	
		Headphone defective	Repair or replace headphone	
		CR1 shorted	Replace CR1	
		CR2 open	Replace CR2	Test by shorting
		C2 defective	Replace C2	C2 is located on the parts module and may be replaced separately. Note solder connections on both sides of the ceramic
Upscale	Dead	CR4 shorted	Replace CR4	Voltage at A, M low
		V2 defective	Replace V2	Check voltages at M,D. Check V2 for shorts
		V3 defective	Replace V3	Check V3 for beta and shorts
		C3 shorted	Replace C3	
Upscale (X10, X1 only)	Dead	C4 shorted	Replace C4	

Upscale	Squeal or Buzz	C6 open	Replace C6	Voltage at A, M low
		C8 open	Replace C8	Check voltage at H. Symptoms may cease when voltmeter is connected
		T1 defective	Repair or replace T1	
Upscale	Hiss or Click	Probe shield shorting to high voltage power supply	Dress leads	Voltage at H low or intermittent. V2, CR7 may be damaged
		Geiger probe defective	Repair or replace geiger probe	Voltage at H low or intermittent. V2, CR7 may be damaged
		Geiger tube defective	Replace geiger tube	
		CR6 defective or not making contact to circuit board	Replace or resolder CR6	Voltage at H high
		T1 defective	Repair or replace T1	Voltage at H low or intermittent
Erratic	Normal	C1 open	Replace C1	
		Meter defective	Repair or replace meter	
High or Low	Normal	R4 not adjusted properly	Recalibrate	

SYMPTOM		PROBABLE CAUSE	CORRECTIVE ACTION	NOTES
Meter	Headphone			
High or Low (cont'd)	Normal (cont'd)	Geiger tube defective or not compatible with instrument's high voltage	Replace geiger tube or correct instrument's high voltage	
		Meter defective	Replace meter	
		CR3 defective	Replace CR3	
		CR5 defective	Replace CR5	Voltage at H low
		CR6 defective	Replace CR6	Check voltage at H
		V2 or V3 beta high or low	Replace with transistor having proper gain	
		C1 defective	Replace C1	
		C8 defective	Replace C8	
		Open contact on S1C	Repair switch	Check resistance at P - N P - Q

FEDERAL EMERGENCY MANAGEMENT AGENCY
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CD V-700-6B
ENI

RESISTANCE CHART

Remove batteries before checking resistances. All values ±20%.

Component	Points	Range Switch Position	Resistance (ohms)
S1A	E - F	All except OFF	0
S1B	M - R M - S	All except OFF X10, X1	0 0
S1C	P - N P - Q	X100, X10 X1	0 0
T1	K - ▲ J - L F - G	Any Any Any	6000 4.6 7.0

VOLTAGE CHART

Voltages negative with respect to point ▲. Use a 20,000 ohms per volt meter. All values ±20% except where noted. Connect 3 volts d.c. to the circuit board as follows: -3V to point E, +3V to point ▲.

Point	Voltage	Voltmeter Range
H	-900	*
M	15	25
A	15	25
F	3	10
D	.05**	10
C	.05**	10
B	.05**	10

* Use a high impedance voltmeter. See Appendix B.
** These values may vary between .01 and .25 volts from instrument to instrument.

Table 4-2. Test Point Chart

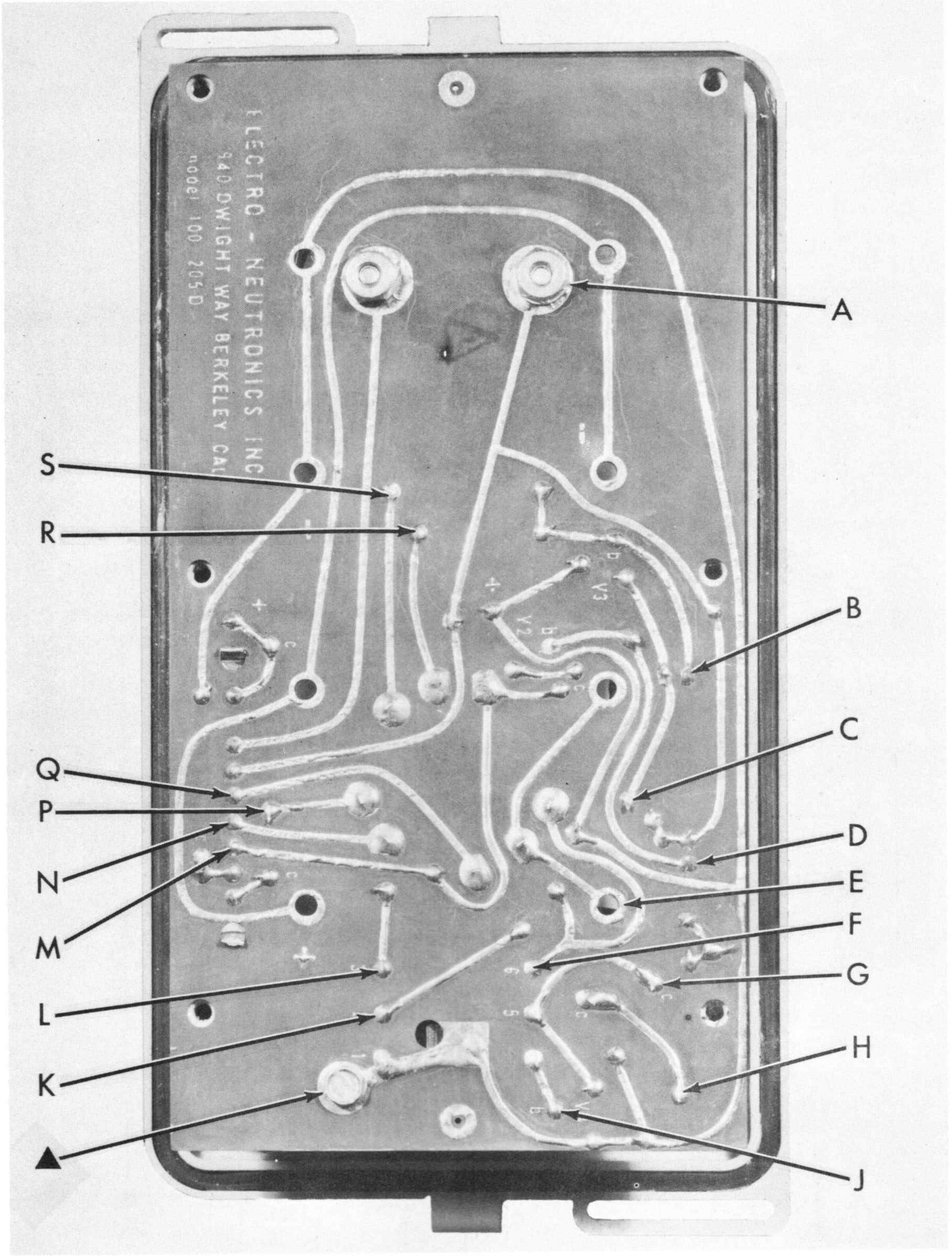
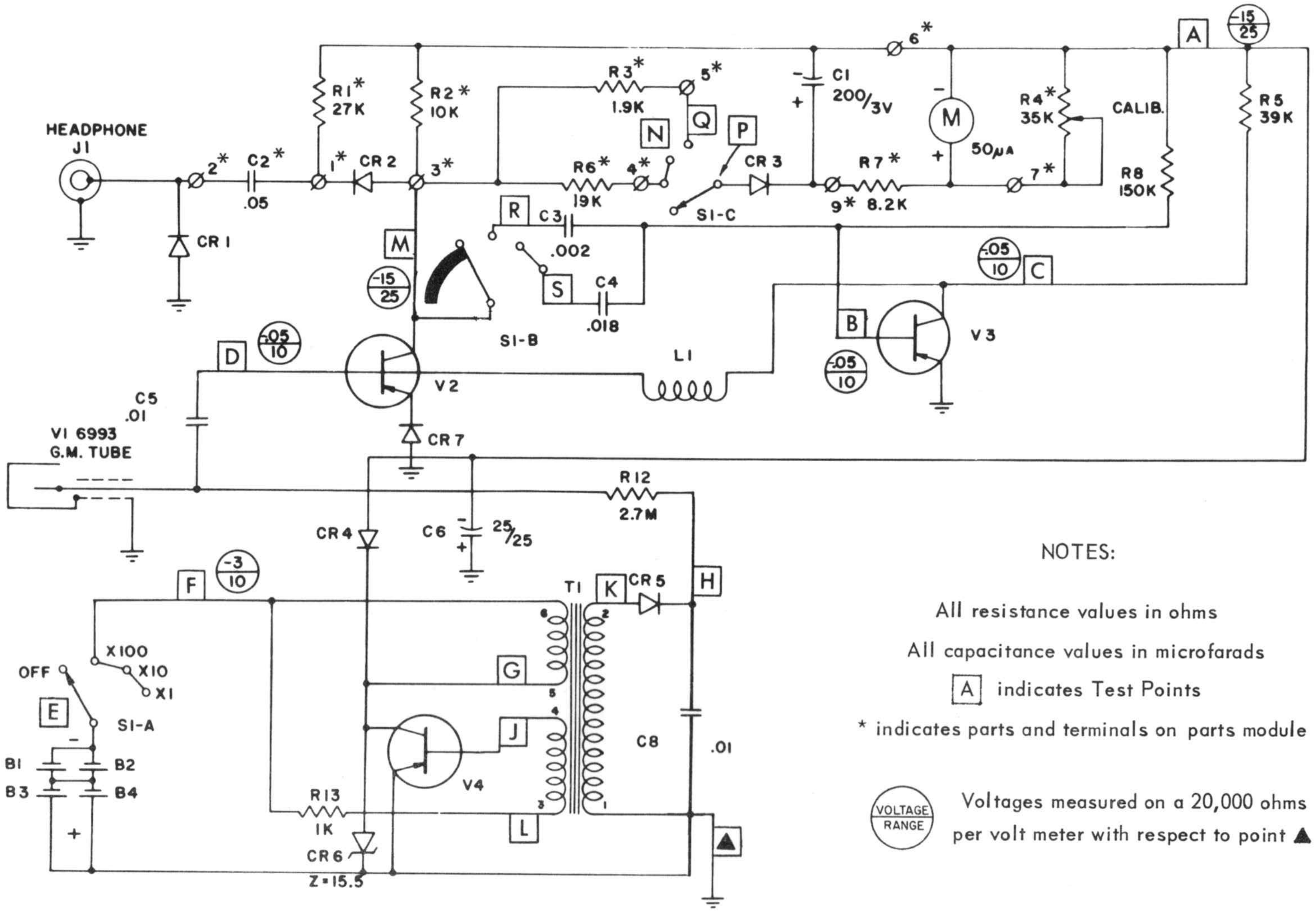


Figure 4-3. Location of Test Points



NOTES:

All resistance values in ohms

All capacitance values in microfarads

A indicates Test Points

* indicates parts and terminals on parts module

VOLTAGE / RANGE Voltages measured on a 20,000 ohms per volt meter with respect to point ▲

Figure 4-4. Schematic Circuit Diagram

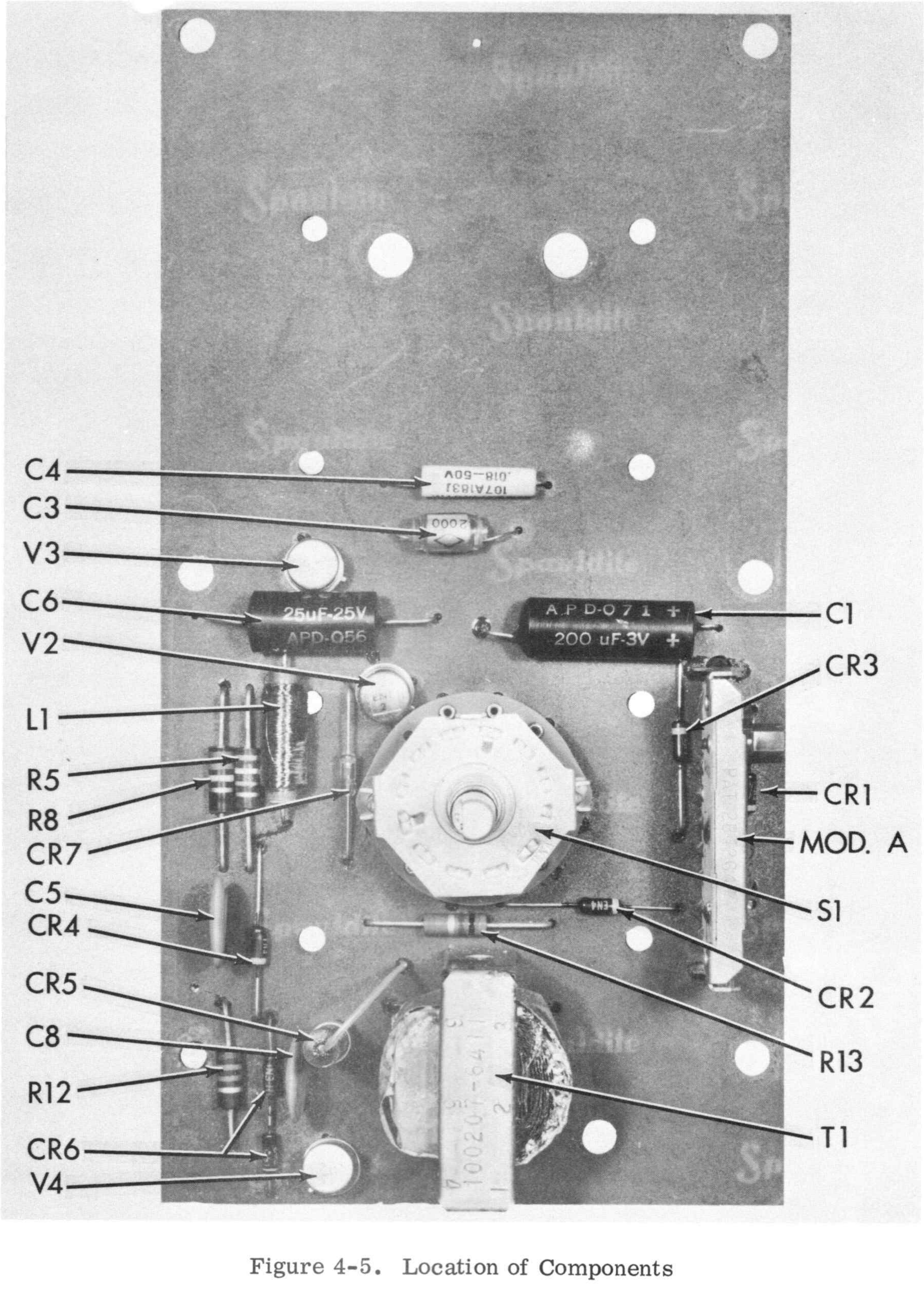


Figure 4-5. Location of Components

PARTS LIST

Electrical Components

Circuit Symbol	Description	Function	Manufacturer & Part No.	ENI Part No.
B1	Battery "D" size 1-1/2V NEDA 13	Supply power	Union Carbide 950	100201-B-1
B2	Battery "D" size 1-1/2V NEDA 13	Supply power	Union Carbide 950	100201-B-2
B3	Battery "D" size 1-1/2V NEDA 13	Supply power	Union Carbide 950	100201-B-3
B4	Battery "D" size 1-1/2V NEDA 13	Supply power	Union Carbide 950	100201-B-4
C1	Capacitor 200 ufd 3V	Current integrating	International Electronic Industries Division Sprague Electric Co.	100201-C-1
C2	Capacitor .05 ufd 50V (See PM-A)	Audio coupling and differentiating	—	—
C3	Capacitor .002 ufd 50V	Timing X100, X10, X1 ranges	Centralab General Instruments	100201-C-3
C4	Capacitor .018 ufd 50V	Timing X10, X1 ranges	General Instruments Centralab	100201-C-4

Circuit Symbol	Description	Function	Manufacturer & Part No.	ENI Part No.
C5	Capacitor .01 ufd 1.4KV	Signal coupling and D.C. blocking	Centralab Sprague Electric Co.	100201-C-5
C6	Capacitor 25 ufd 25V	Low voltage filter	International Electronic Industries Division Sprague Electric Co.	100201-C-6
C8	Capacitor .01 ufd 1.4KV	High voltage filter	Centralab Sprague Electric Co.	100201-C-8
CR1	Diode rectifier, silicon	Audio clipping	Hughes Semiconductor Transitron ENI 4	100203
CR2	Diode rectifier, silicon	Audio coupling	Hughes Semiconductor Transitron ENI 4	100203
CR3	Diode rectifier, silicon	Meter rectifier	Hughes Semiconductor Transitron ENI 4	100203
CR4	Diode rectifier, silicon	Low voltage rectifier	Hughes Semiconductor Transitron ENI 4	100203
CR5	Rectifier, selenium	High voltage rectifier	International Rectifier Corporation Texas Instruments Inc.	100202

Circuit Symbol	Description	Function	Manufacturer & Part No.	ENI Part No.
CR6	Zener diode 15.5V±3% at 2 ma	Voltage regulation	Hughes Semiconductor Transitron ENI-145	100213
CR7	Diode rectifier, germanium	——	Transitron Hughes Semiconductor	100204
H	Headphone 4K ohms at 1kc	Aural indicator	Electro-Neutronics Inc. 100214	100214
J1	Headphone jack	Connector	Electro-Neutronics Inc. 100215	100215
L1	Choke 24 mh 150 ohms	——	Price Electronics Stanwyck Winding Co. Inc. 100388	100388
M	Meter 0-50 ua	Visual Indicator	General Meters Weston Instruments & Electronics	100201-M
PM-A	Parts Module; Contains R1, R2, R3, R4, R6, R7, C2	——	Centralab International Resistance Corp. 100211	100211
R1	Resistor 27K 1/2W 10% (See PM-A)	CR2 reference resistor	——	——

Circuit Symbol	Description	Function	Manufacturer & Part No.	ENI Part No.
R2	Resistor 10K 1/2W 10% (See PM-A)	V2 collector load	——	——
R3	Resistor 1.9K 1/2W 5% (See PM-A)	Current limiting X1 range	——	——
R4	Potentiometer 25K (See PM-A)	Calibration control	——	——
R5	Resistor 39K 1/2W 10%	V3 collector load	Allen-Bradley International Resistance Corp.	100201-R5
R6	Resistor 19K 1/2W 5% (See PM-A)	Current limiting X10, X100 range	——	——
R7	Resistor 8.2K 1/2W 10% (See PM-A)	Meter time constant	——	——
R8	Resistor 150K 1/2W 10%	V3 base resistor	Allen-Bradley International Resistance Corp.	100201-R8
R12	Resistor 2.7M 1/2W 10%	Geiger tube load resistor	Allen-Bradley International Resistance Corp.	100201-R12
R13	Resistor 1000 ohms 5%	V4 base bias	Allen-Bradley International Resistance Corp.	100201-R13

Circuit Symbol	Description	Function	Manufacturer & Part No.	ENI Part No.
S1	Switch 3 pole 4 position	Range selection	Centralab International Resistance Corp. 100206	100206
T1	Transformer	Blocking oscillator power supply	Triad Transformer Corp. Price Electronics 100207	100207
V1	Geiger tube type 6993	Detector	Lionel Electronic Labs. EON Corporation 6993	100201-V1
V2	Transistor, PNP	Multivibrator	Electronic Transistor Corp. Texas Instruments Inc. ENI 2	100208
V3	Transistor, PNP	Multivibrator	Electronic Transistor Corp. Texas Instruments Inc. ENI 3	100209
V4	Transistor, PNP	Power Supply	Electronic Transistor Corp. Texas Instruments Inc. ENI 4	100210

Mechanical Components

Description	Function	Manufacturer & Part No.	ENI Part No.
Battery holder (2)	Holds batteries	Electro-Neutronics Inc. 100219	100219
Battery retainer clip (2)	Holds batteries	Electro-Neutronics Inc. 100241	100241
Cap and chain assembly	Phone jack cover	Electro-Neutronics Inc. 100224	100224
Case bottom	Bottom of instrument	Electro-Neutronics Inc. 100222	100222
Gland	Water seal	Electro-Neutronics Inc. 100227	100227
Handle assembly	Holds probe	Electro-Neutronics Inc. 100221	100221
Handle gasket	Water seal	Electro-Neutronics Inc. 100217/3	100217/3
Jack gasket	Water seal	Electro-Neutronics Inc. 100217/2	100217/2
Knob	Range switch knob	Electro-Neutronics Inc. 100218	100218
Meter gasket	Water seal	Electro-Neutronics Inc. 100217/1	100217/1

Description	Function	Manufacturer & Part No.	ENI Part No.
Name plate	Contains operational check source	Electro-Neutronics Inc. 100223	100223
Panel	Top of instrument	Electro-Neutronics Inc. 100216	100216
Panel gasket	Water seal	Electro-Neutronics Inc. 100242	100242
Printed circuit board	Supports components	Electro-Neutronics Inc. 100205	100205
Probe cable assembly	Holds geiger tube	Electro-Neutronics Inc. 100228	100228
Strap assembly	Carrying strap	Electro-Neutronics Inc. 100225	100225

September 25, 1985

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CD V-700M

ENI

RETROFIT OF ENI CD V-700-6B

(CD V-700M)

The retrofit of the ENI CD V-700 has been designed to accomplish a slight change in function and to improve the instrument's overall performance and efficiency. To meet these goals, these modifications have been made:

•An end window probe (OCD-P-108) containing GM tube type OCD-D-109 has replaced the original GM tube and probe. The OCD-D-109 tube is a selected Amperex Model 200LB, which has been modifed by placing a 1 pF capacitor in parallel with a 10 ohm resistor mounted in the base housing of the tube. -"' tube high-voltage supply of ~575 volts was selected to ensure a useful tube life. In some cases, it is possible to operate this tube in the 900- to 925-volt range of the standard CD V-700; however, it will limit tube life. The OCD-D-109 tube has a window density of between 1.5 and 2.0 mg/cm2. It may or may not detect the presence of alpha particles because of the thickness of the dag coating on the window of the tube. This coating is necessary to prevent the tube from responding to visible light and/or ultraviolet radiation. This tube has a much higher beta-particle detection capability than the thin wall tube it replaces. This is particularly true at low beta energies. The overall x-ray and gamma energy (spectral) response of this tube is currently unknown.

•The detector high voltage has been modified to be compatible with the new tube, to be better regulated, and to be more efficient to improve battery life.

•Improving the HV circuit made the addition of a low-voltage converter circuit necessary.

•The original meter has been replaced with one having a calibration in "counts per minute" only and a response that more closely matches the performance of the circuit.

•A two-cell holder from a Lionel CD V-700-6b has replaced the original four-cell battery. This helps to eliminate the poor contact problem and can be accomplished because of improved circuit efficiency, thus prolonging battery life.

•The circuit modifications have been accomplished by modifying the original PC board slightly and by adding a small retrofit board.

•Components R12 (2.7M), CR4 (rectifier), CR6 (regulator diodes), and R13 (lK) have been removed from the PC board. Refer to your CD V-700-6b (ENI) schematic for location and the modified schematic showing the change. A 100K resistor and an 820K resistor replaced R12, and a 0.01 uP capacitor was added to the high-voltage output circuit.